

AMENDMENTS TO THE SPECIFICATION

Please insert the following corrected pages 5, 6, 7 and 8.

0.05wt.% or less, to find that PM emissions are greatly reduced and good CFPP and lubricity can be secured when the base stock containing sulfur at 0.05wt.% or less satisfies the relationships of $0 < A \leq 4.00$ (wherein, A is content (wt.%), based on total normal paraffin compounds present in the base stock, of normal paraffin compounds having a carbon number of 20 or more), $0.04 \leq [B/C] \leq 0.40$ (wherein, B is content (wt.%) of normal paraffin compounds having a carbon number of (n + 5), C is content (wt.%) of normal paraffin compounds having a carbon number of (n); [B/C] is average B/C ratio; and (n) is a positive integer when total content of normal paraffin compounds having a carbon number of (n) or more is 3.0 wt.% or less and closest thereto, based on the total normal paraffin compounds in the base stock), and $0 < D \leq 8.0$ (wherein, D is content (vol.%), based on the whole base stock, of polynuclear aromatic hydrocarbon compounds), and is incorporated with 0.01 to 0.10wt.% (as the active component) of an FI and 0.002 to 0.1wt.% (as the active component) of a lubricity improver, reaching the present invention.

That is, the present invention provides a diesel fuel oil composition characterized by base stock satisfying the relationships $0 < A \leq 4.00$ (wt.%), $0.04 \leq [B/C] \leq 0.40$ and $0 < D \leq 8.0$ (vol.%), containing sulfur at 0.05wt.% or less, and being incorporated with 0.01 to 0.10wt.% of an FI and 0.002 to 0.1wt.% of a lubricity improver.

The present invention, relating to the above diesel fuel oil composition, includes the following preferred embodiments:

- (1) the diesel fuel oil composition composed of a base stock having a [B/C] ratio of 0.07 to 0.20,
- (2) the diesel fuel oil composition composed of a base stock having a D value of 0 to 5.0 vol.%,
- (3) the diesel fuel oil composition of (1), wherein said base stock has a D value of 0 to 5.0 vol.%,
- (4) the diesel fuel oil composition of (1), wherein active ingredient of the FI is at

- least one type of compounds selected from the group consisting of ethylene glycol ester-based compounds and ethylene-vinyl acetate-based copolymers,
- (5) the diesel fuel oil composition of one of (1) to (3), wherein active ingredient of the FI is at least one type of compounds selected from the group consisting of ethylene glycol ester-based compounds and ethylene-vinyl acetate-based copolymers,
 - (6) the diesel fuel oil composition, wherein content of the active component for the FI is 0.03 to 0.07wt.%,
 - (7) the diesel fuel oil composition of one of (1) to (5), wherein content of the active component for the FI is 0.03 to 0.07wt.%,
 - (8) the diesel fuel oil composition, wherein the active component for the lubricity improver is an ester-based compound,
 - (9) the diesel fuel oil composition of one of (1) to (7), wherein the active component for the lubricity improver is an ester-based compound,
 - (10) the diesel fuel oil composition, wherein content of the active component for the lubricity improver is 0.005 to 0.05wt.%, and
 - (11) the diesel fuel oil composition of one of (1) to (9), wherein content of the active component for the lubricity improver is 0.005 to 0.05wt.%.

~~the~~ The present invention provides a fuel oil composition for diesel engines which efficiently controls PM emissions and exhibits good CFPP and lubricity by incorporating a base stock satisfying the relationships $0 < A \leq 4.00$ (wt.%), $0.04 \leq [B/C] \leq 0.40$ and $0 < D \leq 8.0$ and containing sulfur at 0.05wt.% or less with an adequate FI and lubricity improver.

Detailed Description of the Invention

The present invention is described below in detail. The diesel fuel oil composition of the present invention is characterized by base stock which has the component A, [B/C] ratio and component D in specific ranges, contains sulfur at 0.05wt.% or less, and is incorporated with 0.01 to 0.10wt.% of an FI and 0.002 to

0.1wt.% of a lubricity improver.

The base stock for the present invention mainly comprises a mineral oil, having a flash point of 40°C or higher and 90% distillation temperature of 360°C or lower. The mineral oil for the present invention is a petroleum fraction, including a petroleum fraction obtained by atmospheric distillation of crude oil, and petroleum fraction obtained by atmospheric or vacuum distillation of crude oil and refined by an adequate process, e.g., hydrogenation, hydrocracking, catalytic cracking and a combination thereof. These petroleum fractions can be used individually or in combination. The base stock component other than petroleum fraction includes vegetable oil, e.g., soybean, coconut and rape oil, and animal oil, e.g., whale and fish oil.

The diesel fuel oil composition of the present invention is composed of a base stock which satisfies the relationship $0 < A \leq 4.00$ (wt.%) (wherein, A is content, based on all normal paraffin compounds present in the base stock, of normal paraffin compounds having a carbon number of 20 or more). When A is above 4.00wt.%, the normal paraffin compounds may separate out as ambient temperature decreases, to cause problems, e.g., clogging of the fuel passage or fuel filter in the diesel engine.

The diesel fuel oil composition of the present invention is also composed of a base stock which satisfies the relationship $0.04 \leq [B/C] \leq 0.40$, preferably $0.07 \leq [B/C] \leq 0.20$ (wherein, B is content (wt.%) of normal paraffin compounds having a carbon number of (n + 5), C is content (wt.%) of normal paraffin compounds having a carbon number of (n), [B/C] is average B/C ratio, and (n) is a positive integer when total content of normal paraffin compounds having a carbon number of (n) or more is 3.0 wt.% or less and closest thereto, based on the total normal paraffin compounds in the base stock. Assuming that the component A in the base stock accounts for 3.0wt.% of the total normal paraffin components of the base stock, the

average of the $(n-C_{25})/(n-C_{20})$, $(n-C_{26})/(n-C_{21})$, $(n-C_{27})/(n-C_{22})$ ratios consecutively calculated is in a range from 0.04 to 0.40, inclusive. When $[B/C]$ is below 0.04, some of the normal paraffin compounds in the base stock may separate out as large planar crystals as ambient temperature decreases, even when the relationship $0 < A \leq 4.00$ (wt.%) is satisfied, to easily cause plugging of the fuel filter. In other words, such a base stock has an excessively high CFPP. The similar troubles will occur, when $[B/C]$ exceeds 0.40.

The diesel fuel oil composition of the present invention is also composed of a base stock which satisfies the relationship $0 < D \leq 8.0$ (vol.%), preferably $0 < D \leq 5.0$, more preferably $0 < D \leq 3.0$ (wherein, D is content (vol.%), based on the whole base stock, of polynuclear aromatic hydrocarbon compounds). When D exceeds 8.0 vol.%, PM content in the exhaust gases may increase to an unacceptable level. Normally, a base stock contains aromatic hydrocarbon compounds at 20 to 40 vol.%; single-ring aromatic hydrocarbon compounds at 12 to 30 vol.% and polynuclear aromatic hydrocarbon compounds (having two or more rings) at 2 to 15 vol.%.

Therefore, the fuel oil composition of the present invention for diesel engines shows a good CFPP, even when ambient temperature decreases, when its base stock satisfies the relationships $0 < A \leq 4.00$ (wt.%), $0.04 \leq [B/C] \leq 0.40$ and $0 < D \leq 8.0$ (vol.%).

The component A of the base stock for the present invention can be selected from adequate petroleum fractions of different normal paraffin content. These petroleum fractions include petroleum fractions obtained by atmospheric distillation of crude of varying normal paraffin content, and petroleum fractions obtained by atmospheric or vacuum distillation of crude and refined by an adequate process, e.g., solvent dewaxing and catalytic dewaxing. $[B/C]$ of the base stock can be adjusted by controlling extent of rectification for the distillation operation. $[B/C]$ increases as extent of rectification decreases, and so is vice versa. The component D of the base